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BULLETIN **XCVIII.**

IMPURITIES IN CLOVER SEED.

By J. H. PANTON, M.A., F.G.S., PROFESSOR OF NATURAL
HISTORY AND GEOLOGY.

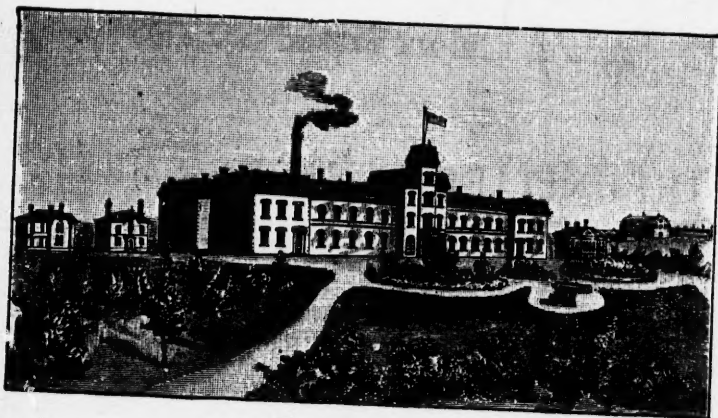
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IMPURITIES IN CLOVER SEED.

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AND GEOLOGY.

Notwithstanding the advancement that has been made in the thorough cultivation of land by the farmers of Ontario, we find the number of species among weeds is on the increase.

This likely arises from a tendency among farmers to introduce seed from other places and not confine themselves for seed to the product of their own farms. Among the seed frequently changed, we may place clover, which on account of its size and form is very difficult to rid of impurities; on this account we may consider it as being a chief source of the introduction of weeds into many farms. The writer obtained sixty samples of clover seed from various parts of Ontario for the purpose of examining them in reference to their purity, cleanliness and vitality. These samples were obtained from wholesale seedsmen, seedsmen selling on commission, and from farmers. The results from an examination of these are interesting, as they show a marked difference in the number of weeds found in each.

In testing the samples three things were kept under consideration:

1. The *purity* of the seed; that is, the extent to which it was true to its kind.
2. The *cleanliness* of the seed; referring to its freedom from the seeds of weeds and foreign substances such as bits of stone, glass, etc.
3. The *vitality* of the seed with reference to its germinating power, when placed under favorable conditions.

Testing seeds for these three characteristics is now becoming quite a common practice among seedsmen of reputation, both in the United States and Canada; and thus we find almost invariably in connec-

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tion with the wholesale seed houses a *testing-ground*, the presence of which has a great tendency to strengthen the confidence of customers. In England and Germany the law demands seedsmen to guarantee the *vitality, purity* and *cleanliness* of the seeds offered for sale.

This has had a most beneficial effect upon the seed sold in those countries to farmers and gardeners, but it does not interfere with export trade, so that while great care may be exercised to sell a good article at home, yet a much inferior may find its way into our country. Much loss is sustained yearly from seed being not *true* to name, not *clean* and low in *vitality*, and as yet there seems no redress for the unfortunate purchaser in Ontario. It is claimed that most seedsmen are sufficiently jealous of their reputation to be a safeguard against imposition. This may be true to some extent, but it is feared there are many who run the risk of selling seeds they would not if they knew the law was ready to protect the unlucky purchaser. There is no doubt the use of "testing-grounds" by seedsmen has lessened the trouble very much.

We would scarcely imagine that men would stoop to grind up quartz, sift and color it, so as to adulterate clover seed, and yet this has been conclusively shown to have been followed by some. Cases have occurred in which men have had hundreds of pounds of this spurious material sold to them in adulterated clover seed. Clover seed may be considered one of the most impure seeds in the market.

In making our observations, one-half ounce of the seed was taken from the sample obtained and the number of weed seeds, particles of sand, dirt, etc., carefully counted. The species of weed seed was also noted. One hundred seeds were tested for *vitality* by placing them in conditions favorable to germination, such as moisture, suitable temperature and darkness. The number that sprouted showed the per cent. vital.

The vitality of seeds can be fairly well ascertained by placing seeds between sheets of blotting paper laid on sand, and keeping the paper moist. The samples should be kept where the temperature is not lower than that of the air. If it can be kept about 75° to 85° F. all the better. Some place the seeds on a piece of flannel and cover them also with flannel. The whole is placed in a saucer or plate, kept moist in a warm room and allowed to germinate. If one hundred seeds are used the number germinating indicates the per cent. vital.

If seeds are scattered upon a piece of black cardboard the foreign grains, etc., can be readily detected.

The following figures represent the forms of the seeds of some of the most common weeds, enlarged and natural size:



RIB-GRASS.



OX-EYE DAISY.



CHICORY.



SORREL.



RAGWEED.



BINDWEED.



WHITE COCKLE.



BLADDER CAMPION.



BLACK BINDWEED.



CHESS.

The following tabulated statement gives in concise form the results of our examination of the samples obtained from sixty different sources:

Tabulated statement showing impurities in Clover Seed.

No.	Where from.	No. of weed seeds in 1 oz.	Other impurities, sand, etc.	Per cent. of weed seeds.	No. of weeds to clover plants in a square yard.	Kind of clover.	Vitality per cent.	Grass.	White clover.	Sorrel.	Campion.	Chicory.	Rib-grass.	Ragweed.	Smart-weed.	Cheese.	Black bindweed.
1	Uxbridge	117	some	.58	4	A	93	103	3	10	1						
2	"	135	much	1.44	10	R	94	92	27	...		4	12				
3	"	420	"	2.1	17	A	92	206	78	108		7	19				
4	Guelph	483	little	5.17	38	R	90	273	61	72		5	61	3		10	
5	Lindsay	607	some	6.07	24	A	93	550	24	...		26					
*6	Toronto		clean.			A	95										7
*7	"	9	"	.09	.3	R	95	7	2	1							
*8	"	6	"	.06	.4	R	98	3	2	1							
9	"	30	some	.3	1	R	96	21	9	6							
10	Guelph	47	little	.5	4	A	92	25	7	12	3	4					
11	St. Marys.	78	"	.39	3	R	94	61	9	7						1	
*12	"	2	much	.02	15	A	93	2									
*13	London	4	little	.04	31	R	96	2									
14	"	64	much	.32	2.5	A	96	40	12	2			12				
*15	Hamilton	4	clean	.04	.31	R	98	4									
16	"	57	fair	.28	2	A	97	12	42								
17	Toronto	168	fair	.8	6	R	91	100	56			2				2	3
*18	"	2	some	.02	15	A	94	2									3
19	Bowmanville	4	clean	.04	31	R	94	1		3							
20	"	22	clean	.11	.5	R	96	8		3							
*21	Toronto	4	"	.04	.31	A	97	1		9		1					
22	"	4	fair	.17	1	R	97	14		11	2					1	
23	Waterford	34	"	.17	1	R	90	4		9							
24	"	16	clean	.17	1	A	83	4		1820						1	
25	Simcoe	1824	little	.09	.7	R	89			116							
26	"	120	"	1.2	9	R	89			9							
*27	"	4540	much.	22.7	180	A	49			4540							

28 St. Marys

29 Vaughan

30 St. Marys

748 little

540 fair

3.7

29

-764

3.7

23	Waterford	16	17	1	792	A	87	14	1	2
24	"	1824	1.17	1	742	R	90	4	5	3
25	Simcoe	9	9	72	721	A	83	4	1820	
26	"	120	1.09	.7	742.3	R	79	9	116	
27	"	4540	1.2	9	734	R	89	4	4540	
	much		22.7	180	-613	A				

28	St. Marys	748	3.7	29	-764	A	91	34	714	540	1
29	Vaughan	540	5.7	42	-701	R	89				
30	St. Marys	106	1.1	8	735	R	87	83	12	1	5
31	Guelph	61	.54	4	739	R	83	12	4	30	
32	Brantford	16	.17	1	742	R	83	5	6		
33	Guelph	4	.04	4	742	R	87	4			
34	"	51	.54	4	739	R	90	28	10	13	3
35	"	1712	8.5	67	-739	R	69	720	360	540	
36	Embro	2	.01	1	-792.9	A	93	2		92	
37	"	1	.07	742.83	A	93					
38	Woodville	6	.05	1	-742.6	R	89	6			
39	"	36	.18	1	-792	R	90	4	32		1
40	Furon County	43	.45	3	740	R	91	10	27		
41	"	765	3.8	30	-763	A	87	300	22	443	2
42	Guelph	805	4.02	31	-762	A	90	39	742		4
43	"	36	.3	2	-741	A	92	2	34		
44	Middlesex	14	.07	5	-739.5	R	89	6	7		2
45	"	8	.08	.61	-742.89	R	84	8			
46	Kingston	16	.08	.61	-742.89	R	84	8			1
47	"	1	.01	.07	-742.93	R	97		15		
48	Bruce County	120	.01	.07	-742.93	R	97				1
49	"	8	.06	4	-769	A	89	63	15	39	3
50	Oshawa	82	.08	.61	-742.39	R	94	5			
51	Waterloo	2	.82	6	-737	R	89	67	3	7	
52	Dundas	5	.03	.15	-742.85	R	95	2			5
53	"	200	.05	.3	-742.7	R	93	3			
54	Russell County	15	1	7	-786	A	84	22	175		
55	Owen Sound	210	.16	1	-742	R	92	10			3
56	Guelph	55	1.06	8	-786	A	82	160	30	18	
57	Toronto	1	.01	.07	-742.93	R	85	17	33		2
58	"	10	.05	.03	-792.7	R	94	1			5
59	Kingston	7	.07	.49	-742.5	R	93	3	7		4
60	Toronto	15	.07	.5	-792.5	A	92				
						A	91		5		1

1 lb. of alsike clover=840,000 seeds. 1 lb. of red clover=300,000 seeds. Rate of sowing used in the above calculations: Alsike, 6 lb. to the acre; red clover, 12 lb. to the acre. Under the column "Kind of clover," A indicates alsike, R red. *Nos. 6, 8, 12, 13, in 1/2 oz. alsike would give 22,464 weeds in an acre. †No. 27, a sample as obtained from a farmer before cleaning. 117 weeds in 1/2 oz. red clover would give 51,840 weeds in an acre.

Of the sixty samples examined, 53 contained grass seeds; 27, seeds of white cockle (*Lychnis vespertina*); 32, sorrel (*Rumex Acetosella*); 8, Campion (*Silene inflata*); 17, chicory (*Cichorium Intybus*); 9, rib-grass (*Plantago lanceolata*); 4, ragweed (*Ambrosia artemisiifolia*); 3, smartweed (*Polygonum Pennsylvanicum*); 5, chess (*Bromus scaberrimus*); 5, black bindweed (*Polygonum convolvulus*).

CONCLUSIONS.

1. The number of seeds present is of more importance than their weight in determining the number of weeds.
2. The presence of weed seeds is far more serious than any adulteration from pieces of quartz, gravel, wood, etc.
3. It is a great mistake to buy cheap seed, as it is likely to possess poor vitality by being old and to contain the seeds of weeds. Seedsmen who sell pure seed require expensive machines to clean it, and therefore cannot be expected to sell their seed as cheap as those who take but little pains to have a good article.
- Nos. 6, 8, 12, 13, 15, 18, 21, 57, 58 were obtained from wholesale seedsmen; No. 27, a sample from a firm before it had been cleaned, while most of the others were from commission merchants or farmers.
4. Among the most common foreign seeds likely to be in clover are: Grass seeds, white cockle, sorrel, rib-grass, ox-eye daisy, chicory, smartweed, chess, black bindweed, false flax and thistle.
5. Every farmer should have a collection of the seeds of weeds. It would not be a difficult matter to collect a sample of each; this would be of great assistance in identifying the seeds of weeds which might become a great pest.
6. Farmers should examine carefully all new seeds from other places. A very few weed seeds in half an ounce of seed will be thousands in what is required to sow an acre. See table.
7. The samples examined were quite true to name; the vitality of the seeds was high, many reaching over 90 per cent. It is usual to deduct 8 per cent. from the laboratory test to represent the field vitality where conditions are not so favorable to germination.